CLAIMS

What is claimed is:

1. 1.   A learning internetwork switch for use in a network that includes a plurality of

2.   virtual local area networks, the learning internetwork switch comprising:

3.   a first set of ports connecting the learning internetwork switch to a set of

4.   virtual local area networks, wherein each virtual local area network of

5.   the set of virtual local area networks is a virtual local area network of

6.   the plurality of virtual local area networks that is locally attached to the

7.   learning internetwork switch;

8.   a second set of ports connecting the learning internetwork switch to a router,

9.   wherein devices that belong to the virtual local area networks in the set

10.   of virtual local area networks communicate with the router by

11.   transmitting packets through the learning internetwork switch; and

12.   a learning mechanism that inspects control packets sent between the router and

13.   the devices, the learning mechanism storing association data that

14.   indicates a correspondence between data link layer addresses, network

15.   layer addresses, and the first set of ports based on information

16.   contained in the control packets;

17.   said learning internetwork switch using said association data to forward traffic

18.   between locally attached virtual local area networks.

1. 2.   The learning internetwork switch of Claim 1 wherein:

2   a third set of ports on the router connect the router to the second set of ports; and

3   and

4   the learning mechanism is further configured to store data indicating a

5   correspondence between data link layer addresses of the third set of

6   ports and network layer addresses of the third set of ports based on

7   information contained in the control packets.

1 3. The learning internetwork switch of Claim 1 further including a proxy

2   forwarding mechanism configured to:

3   detect when a packet sent by a first device of a first virtual local area network

4   in the set of virtual local area networks contains a data link layer

5   destination address associated with the router and a network layer

6   destination address associated with a second device of a second virtual

7   local area network in the set of virtual local area networks;

8   determine the data link layer address of the second device based on the

9   network layer address of the second device;

10   replace in the packet the data link layer destination address associated with the

11   router with the data link layer address associated with the second

12   device; and

13   transmit the packet through the port of the first set of ports to which the second

14   device is connected.

1 4. The learning internetwork switch of Claim 1 wherein:

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2   the control packets include packets which are request packets that request a

3   data link layer address of a port of the router; and

4   the request packets contain a data link layer source address associated with the

5   device sending the packet, a network layer source address associated

6   with the device sending the packet, and a network layer destination

7   address associated with the port of the router.

1   5.   The learning internetwork switch of Claim 3 wherein:

2   the packet includes a data link layer source address associated with the first

3   device; and

4   the proxy forwarding mechanism is further configured to:

5   determine a data link layer address associated with a port of the router

6   which serves as a default gateway to the second virtual local

7   area network; and

8   replace in the packet the data link layer source address associated with

9   the first device with the data link layer address associated with

10   the port of the router which serves as the default gateway to the

11   second virtual local area network.

1   6.   A method, for use by a learning internetwork switch connected to a router, for

2   determining locations of devices that belong to a set of virtual local area

3   networks locally attached to the learning internetwork switch, the method

4   comprising the steps of:

5　　　receiving at a first port a packet from a device that belongs to one of the virtual

6　　　　　local area networks, wherein the packet includes a network layer

7　　　　　destination address that corresponds to a particular port of the router;

8　　　determining whether the packet is a request for the data link layer address of

9　　　　　the particular port of the router;

10　　if the packet is a request for the data link layer address of the particular port of

11　　　　　the router, then

12　　　　　reading a data link layer source address and a network layer source

13　　　　　　address from the packet;

14　　　　　storing data indicating that the data link layer source address

15　　　　　　corresponds to the network layer source address;

16　　　　　storing data indicating that the device that originally transmitted the

17　　　　　　packet is connected to the first port; and

18　　　　　forwarding the packet to the particular port of the router.

1　7.　　The method of Claim 6 further comprising the steps of:

2　　　if the packet contains a message to be sent through the router to a second

3　　　　　device that belongs to a second virtual local area network of the set of

4　　　　　virtual local area networks, then performing the steps of:

5　　　　　reading from the packet a network layer destination address associated

6　　　　　　with the second device;
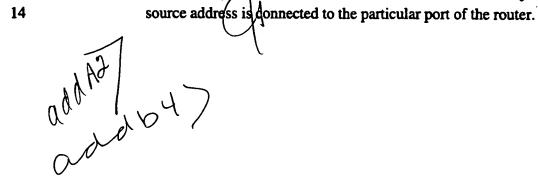
7   performing a lookup operation to determine if configuration

8   information has been stored for the network layer destination

9   address;

10   if configuration information has been stored for the network layer

11   destination address, then reading the configuration information

12   to determine a data link layer address of the second device and

13   that the second device is connected to a second port of the

14   learning internetwork switch; and

15   forwarding the packet to the second device through the second port.

1   8.   The method of Claim 7 wherein the step of forwarding the packet includes the

2   steps of:

3   replacing, in the packet, a data link layer destination address associated with

4   the router with the data link layer address associated with the second

5   device; and

6   replacing, in the packet, a data link layer source address associated with the

7   device with a data link layer address associated with a port of the router

8   that is connected to the second virtual local area network.

1   9.   The method of Claim 7 further including the step of forwarding the packet to

2   the router if configuration information has not yet been stored for the network

3   layer destination address.

1 10. The method of Claim 7 further comprising the step of determining whether

2   proxy forwarding is active, and performing the step of forwarding the packet

3   to the second device through the second port only if proxy forwarding is

4   active.

1 11. The method of Claim 6 further comprising the steps of:

2   receiving from the router a response packet to the packet, the response

3   packet including a data link layer address associated with the

4   particular port of the router;

5   inspecting the response packet to determine the data link layer address

6   associated with the particular port of the router;

7   storing data that indicates that the data link layer address of the

8   particular port corresponds to the network layer address of the

9   particular port; and

10   forwarding the response packet to the device through the first port.

1 12. The method of Claim 11 further comprising the step of storing data that

2   indicates that the virtual local area network is connected to the particular port

3   based on information contained in the response packet.

1 13. A method, for use by a learning internetwork switch, for performing proxy

2   forwarding between a first device on a first virtual local area network and a

3   second device on a second virtual local area network, where the first virtual

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4   local area network and the second virtual local area network are locally

5   attached to the learning internetwork switch, the method comprising the steps

6   of:

7   receiving a packet from the first device that specifies a network layer

8   destination address and a data link layer destination address, wherein

9   the specified network layer destination address is a network layer

10   address associated with the second device and the data link layer

11   destination address is a data link layer address associated with a first

12   port of a router connected to the learning internetwork switch;

13   performing a lookup operation to determine a data link layer address associated

14   with the second device;

15   if the data link layer address associated with the second device is found during

16   the lookup operation, then

17   changing the data link layer destination address specified in the packet

18   to the data link layer address associated with the second device;

19   and

20   forwarding the packet to the second device over the second virtual local

21   area network.

1   14.   The method of Claim 13 wherein:

2   the packet specifies a data link layer source address, wherein the data link layer

3   source address specified in the packet is a data link layer address

4   associated with the first device;

5   a second port of the router is connected to the second virtual local area

6   network; and

7   the method further comprises the step of changing the data link layer source

8   address in the packet to a data link layer address associated with the

9   second port prior to forwarding the packet to the second device.

1   15.   The method of Claim 13 further comprising the step of learning a location of

2   the second device prior to receiving from information contained in a previous

3   packet transmitted by the second device.

1   16.   The method of Claim 15 wherein the step of learning includes the steps of:

2   receiving at a particular port of the learning internetwork switch the previous

3   packet;

4   determining that the previous packet is addressed to a particular port of the

5   router;

6   reading a data link layer source address and a network layer source address

7   from the previous packet;

8   storing data that indicates that the data link layer source address is the data link

9   layer address associated with the network layer source address;

10   storing data that indicates that the device associated with the network layer

11   source address is connected to the particular port of the learning

12   internetwork switch;

13   storing data that indicates that the device associated with the network layer

14   source address is connected to the particular port of the router.

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